PROMOTING MIXED STANDS THROUGH CONVERSION TREATMENTS. EFFECT OF HOLM OAK COPPICES THINNING ON BLACK PINE REGENERATION

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OLD COPPICES FOR FIREWOOD PRODUCTION IN MEDITERRANEAN QUERCUS STANDS: How to manage them for today's needs and threats?

In Spain and at the Mediterranean basin, *Quercus* woodlands formerly dedicated to firewood production currently occupy wide areas. These *Quercus* coppices present both **serious silvicultural and economic problems**, due to the abandonment of the traditional and intensive management techniques and harvesting (**clear-cuttings in short rotations**). Current woodlands are over-aged monospecific stands, with excessive density, with diameter and height growth stagnation and a great risk of wildfires with scarce production of forest goods or services.

Marks for the second thinning in an old coppice of holm oak.

Proved good alternative for old coppices in Mediterranean regions:

Conversion treatment to high forest over stump

The conversion treatment of old *Quercus* coppices consists of thinning treatments with variable intensity and rotation, in addition to pruning and brush out operations. In holm oak stands, basal area reduction of 50% results in improvement of growth rates and forest structure changes but it doesn't causes an excessive stump resprout.

OBJECTIVE

How effective are conversion treatments in changing old coppice structure and species composition?

EXPERIMENTAL DESIGN

→ Experimental trial for the analysis of conversion treatments depending on ecological factors and silvicultural parameters in **Central Spain** (Guadalajara province).

→ The experimental design (three locations; only one is showed here) includes **different thinning intensities** (**from 0 to 100% of extracted basal area**). Unit: plots of 10 m x 10 m (60 plots/location)

→ Climate: **continental Mediterranean**. **Shallow terra rossa soil over limestone**

→ Original vegetation: homogeneous dense coppices of *Quercus ilex* with isolated overtopping *Pinus nigra* trees, probable relicts of the original mixed stand composition.

→ Complete dasometric **Inventories** have been carried out in **1994 and 2010**

→ First thinning treatments were done in 1995; second thinning in 2011

→ **Regeneration of black pine**: transect per plot in diagonal of 14.14 m x 1 m

Quantification of pine regeneration in **four categories**: (1) h<30 cm; (2) 30cm < h< 130 cm; (3) h >130 cm and d< 5 cm; (4) h >130 cm and 5 cm < d < 10 cm.

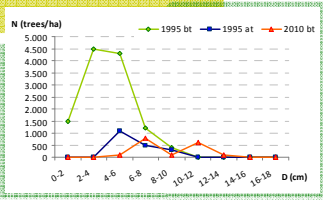
Left: Control plot with the typical structure of old holm oak coppice (with isolated black pine trees)
Right: Conversion treatment through coppice thinnings induces changes in structure and species regeneration.

RESULTS

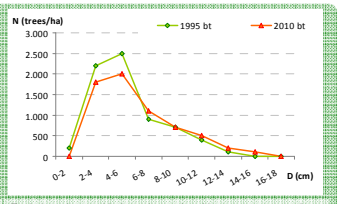
✓ Fifteen years after thinnings an **abundant pine regeneration** was installed in the woodlands: regeneration abundance is **related with basal area reduction**.

✓ Distance to mature trees or relationship with other stand density or competition indexes would be considered in following analysis.

✓ The fast installation of *Pinus* regeneration suggests the potential of the zone for the restoration of multipurpose mixed *Quercus-Pinus* stands in wide areas where *Quercus* species were favoured by human populations for firewood and charcoal production.



Evolution of holm oak coppice with heavy thinning (68.3% Gext and 84% Next). Inventories of 1995 before thinning (1995 bt), 1995 after first thinning (1995 at) and 2010 before second thinning (2010 bt). $G_{1995\,bt}$ =18.9 m²/ha and Dg_{1995bt}=4.5 cm. $G_{2010\,bt}$= 10.94m²/ha and Dg_{2010bt}= 9.05 cm.

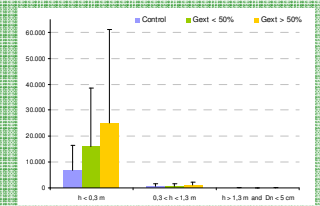


Evolution of control holm oak coppice. $N_{1995\,bt}$= 7000 trees/ha. $N_{2010\,bt}$= 6400 trees/ha. $G_{1995\,bt}$= 19,5 m²/ha . $Dg_{1995\,bt}$=5.95 cm

The **conversion treatment** caused changes in forest dynamics in the short term, **diversifying the forest structure**.

		Black pine regeneration (trees/ha)			
		h < 0,3 m	0,3 < h < 1,3 m	h > 1,3 m and Dn < 5 cm	5 cm < Dn < 10 cm
Control	Mean	6.811,3	704,0	76,1	0,0
	Standard deviation	9.529,3	875,4	234,2	0,0
	Maximum	40.334,9	3.044,1	761,0	0,0
Gext < 50%	Mean	15.981,7	570,8	0,0	0,0
	Standard deviation	22.604,3	983,8	0,0	0,0
	Maximum	73.059,4	3.805,2	0,0	0,0
Gext > 50%	Mean	25.019,0	1.046,4	47,6	0,0
	Standard deviation	35.992,9	1.299,7	190,3	0,0
	Maximum	132.420,1	5.327,2	761,0	0,0

Black pine seedling in thinned old Mediterranean coppices



Mean values of regeneration of black pine –trees/ha- (+ standard deviation) of control plots, moderate and heavy thinning in conversion treatments plots.

CONCLUSIONS

Conversion treatment of coppices, with the creation of **mixed stands**, constitutes a good management alternative for extensive areas and an interesting technique to adaptation to global change. **Structural enrichment** of mixed forests increases the stability of the system and the habitat value for wildlife (nesting and roosting facilities)

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